REMARKS

Reconsideration of this application is requested.

It is proposed to delete "less than" from the range of Mg concentration recited in claims 1 and 2. There is clear and unequivocal support for the now recited range of from 0.5 to 5 ppm in the applicants' disclosure. See, for example, page 5, line 24 for the lower limit and page 6, line 8 for the upper limit of 5 ppm.

The reference to 0.3 g/L has been retained in claim 1 as the upper limit on the excess alkalinity concentration. There is support in the applicants' disclosure for this feature. See page 8, line 8 and original claim 2.

In view of the foregoing, the Examiner is requested to reconsider the Section 112, 1st ¶ rejection of the claims. The claims do not contain new matter and otherwise meet the requirements of Section 112, 1st ¶.

The Examiner is also requested to reconsider the Section 103(a) rejection of claims 1-7, 9 and 10 as unpatentable over Nagy. It is noted in this regard that the Examiner has recognized that the evidence presented appears to show unobvious results but, according to the Examiner, the claims do not include the features necessary to produce the results which have been demonstrated. However, with respect, it is submitted that the evidence does support the claims of record with the limitations recited, i.e. the claims do in fact recite the conditions responsible for the indicated results.

Claim 1, as amended, requires the following conditions:

(1) an Mg to Al molar ratio of 5-20 to 1, preferably about 10 (see claim 2);

(2) an Mg concentration of 0.5 to 5 ppm;

(3) sufficient alkali metal hydroxide to provide excess alkalinity concentration of between 0.1 to 0.3 g/L alkali metal hydroxide; and

(4) preferably excess alkalinity of between 0.1 to 0.2 g/L alkali metal hydroxide (claim 7).

In connection with the above, it is noteworthy that the applicants' evidence as set out in the Twardowski declaration shows unobvious results using the following conditions representative of the applicants' invention:

Mg/Al molar ratio (claimed: 5-20/1, preferably about 10)

5.5 (Experiment No. 2, ¶ 14, page 9 of the declaration)

5.6 (Experiment Nos. 1 and 2 of declaration Exhibit A)

6.7 (Experiment No. 1, ¶ 14, page 8 of declaration)

8.9 (Experiment No. 1, ¶ 14, page 8 of declaration)

11.1 (Experiment Nos. 2, 3 of Exhibit A and Experiment No. 1, ¶ 14, page 8 of declaration)

Mg concentration (claimed: 0.5 to 5 ppm)

0.5 ppm (Experiment No. 1 of Exhibit A)

1.0 ppm (Experiment No. 2 of Exhibit A)

2.0 ppm (Experiment No. 3 of Exhibit A)

3-5 ppm (Experiment No. 1, ¶ 14, page 8 of declaration)

Alkalinity (claimed: 0.1 to 0.3 g/L, preferably 0.1 to 0.2 g/L)

0.1-0.2 g/L (Experiment Nos. 1, 2 and 3 of Exhibit A; Experiment Nos. 1 and 2, ¶ 14, pages 8-9 of declaration)

The applicants submit that this showing is fairly and reasonably representative of the scope of their claims.

The applicants' evidence is discussed in more detail in the Twardowski declaration, segments of the discussion being re-presented below for the Examiner's possible ease of reference:

Exhibit A of the declaration includes the results of three experiments, each of which includes nine separate runs or tests and a further experiment comprising eight different runs considered reasonably representative of Nagy. The various runs constituting Experiment Nos. 1-3 and the Experiment representative of Nagy were carried out under the same conditions except for the variations in the columns representing Al

content in the starting brine, Mg added, Mg/Al molar ratio and NaOH. Removal efficiency was measured at the intervals (residence times) indicated.

The various tests were carried out by adding Mg and NaOH to brine containing Al at 50°C. This results in the precipitation of a complex of Mg, Al and OH which was removed, after which the resulting brines were checked for efficiency of Al removal. In Experiment Nos. 1-3, efficiency was measured immediately after addition of the Mg and NaOH and removal of the precipitate (i.e. zero residence time) and after 15 and 30 minutes residence times. The residence times for the Nagy experiment were 20 minutes, 40 minutes and 180 minutes at 66°C. The results of the experiments are tabulated in Exhibit A and graphically illustrated by the charts attached thereto. These results show how the efficiency of Al removal varies with Mg content, Mg/Al ratio and alkali concentration (NaOH).

The "Conclusion" section (pages 3-4 of Exhibit A) brings out the importance of observing the specific combination of conditions called for in the applicants' claims. This combination of conditions is not disclosed or suggested by Nagy (Diamond Shamrock) and the results thereof could not have been predicted from Nagy.

While the results set forth in Exhibit A speak for themselves in showing the unpredictable results obtained by the applicants' invention, the following specific comments on the results given in Exhibit A may be useful.

Of the Experiment No. 1 runs or tests, only the first two meet the requirements of the applicants' invention regarding Mg added, Mg/Al molar ratio and NaOH added. The conditions used which are representative of the applicants' invention are: 0.5 ppm Mg, 5.6 Mg/Al molar ratio and 0.1 or 0.2 NaOH g/L. The remaining runs of Experiment No. 1 use either more NaOH (the third run) and/or a lower Mg/Al molar ratio (all the other runs).

The conditions used in Experiment Nos. 2 and 3 representative of applicants' invention are 1.0 ppm Mg, 11.1 or 5.6 Mg/Al molar ratio and 0.1 or 0.2 g/L alkalinity (Experiment No. 2) or 2.0 ppm Mg, 11.1 Mg/Al molar ratio and 0.1 and 0.2 g/L alkalinity for Experiment No. 3.

As noted in the Twardowski declaration, the results of Experiment No. 3 are particularly striking as these show that runs representative of the invention (the 4th and 5th runs where the Mg/Al molar ratio is 11.1 and the NaOH content is 0.1 or 0.2) gave higher removal efficiencies than comparable runs (first and second) using double the Mg/Al ratio (22.2). While the removal efficiency for the first, second and third runs of Experiment No. 3 is good, the possibility of obtaining equivalent or, in this case, better removal efficiency at the lower Mg/Al ratio (11.1) consistent with the applicants' invention minimizes the possibility of introducing a further unwanted solids to the brine feedstock.

The Twardowski declaration (see ¶ 14) included additional test data confirming the unique results obtained by observing the specific conditions called for in the applicants' claims. Thus, Experiment No. 1 referred to in ¶ 14 of the declaration describes three separate experiments using 3 ppm, 4 ppm and 5 ppm of added Mg, Mg/Al molar ratios of 6.7, 8.9 and 11.1, respectively, and NaOH added to give an excess of between 0.1 and 0.2 g/L, again all within the applicants' claim 1. The test results show 98-99% aluminum removal efficiency.

Experiment No. 2, discussed beginning with the last ¶, page 8 of the Twardowski declaration, was similar to Experiment No. 1 except that the brine included 1 ppm aluminum rather than 0.5 ppm aluminum as in Experiment No. 1 and Mg/Al molar ratios were 1.1, 2.2, 3.3, 4.4 and 5.5, respectively. Only the test using the 5.5 Mg/Al molar ratio is within the applicants' invention.

The results of Experiment No. 2 as tabulated at page 9 of the declaration show the applicants' process giving an Al removal efficiency of 99% compared to significantly lower efficiencies using the Mg/Al molar ratios outside the applicants' claims.

It is respectfully submitted that the applicants' test data provides a fair comparison of representative conditions within the scope of the present claims and conditions just outside (note, for example, in the test results given in Table 2 of the Twardowski declaration using the molar ratio of Mg/Al of 5.5 which is just within the applicants' lower limit of 5 and the ratio of 4.4 which is just below the applicants'

conditions giving a 99% aluminum removal efficiency while the 4.4 Mg/Al molar ratio, other conditions being the same gave a 79% Al removal efficiency.

Favorable reconsideration of the Section 103(a) rejection, with allowance, is requested in view of the foregoing and the evidence of record.

Respectfully submitted,

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APPENDIX

Version with Markings to Show Changes Made

IN THE CLAIMS

The claims are amended as follows:

1. (Amended) A method for the reduction of soluble aluminum species in an evaporated salt alkali metal halide brine containing up to 500 ppb aluminum species to provide a brine feedstock suitable for use in a chlor-alkali membrane cell process, said method comprising:

(c) treating said brine with a magnesium salt in an amount to provide a Mg to Al molar ratio selected from 5-20 to 1 and at a Mg concentration of [at least] from 0.5 [and less than] to 5 ppm, and sufficient alkali metal hydroxide to provide an excess alkalinity concentration of between 0.1-0.3 g/L alkali metal hydroxide to effect precipitation of a magnesium aluminum hydroxide complex; and

(d) removing said complex to provide said brine feedstock.

2. (Thrice Amended) A method as defined in claim 1 wherein said Mg to Al molar ratio is about 10:1 and said Mg concentration is from 1 to [less than] 5 ppm.